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itor: D. B. Finn

The *FAO Fisheries Bulletin* will henceforth appear as a quarterly publication instead of bimonthly heretofore. This change, made necessary by the exercize of certain economies, should in no ay decrease its usefulness and it is hoped will make possible certain improvements. The next ue to appear will be April/June 1954.

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Figure 1. View of Lake Tiberias from Beit Yerach, Israel.

Figure 2. Typical fishing boats used on Lake Tiberias.

BIOLOGICAL POSSIBILITIES IN WORLD FISHERIES*

In 1949, one of the authors (M. G.) attended a conference at the United Nations[1] which he considers to have been of unusual importance in that, for him, it marked a change in attitude from the short-sighted materialism of the first half of the twentieth century to what, he hoped, indicated a brighter and wider humanism in the second half. He saw, he thought, the promise of change from a technical culture to a biotechnical one. The future culture would be biotechnical over a broad field: it would pay sufficient attention to deeper needs of human beings, as these became better delineated by revision of old ideas and by new discovery; and it would pay more attention to the essential properties of the vegetable and animal kingdoms. Over the whole field, better understanding should result in greater real wealth, both in natural capital and natural interest. Many natural systems are best thought of as capital — forest lands, agricultural soil, breeding stocks of animals — whereas crops are forms of natural interest: the annual increase of timber grain, meat or fish. Business enterprise clearly recognizes the distinction between capital and interest of money, and so has usually assumed that the annual profit from exploitation of a natural resource can be safely treated solely as interest. Thus it has come about, over wide areas of the world, that we have inadvertently drawn on natural capital: of prairie soil, of forest systems, of stocks of animals. The same lack of understanding can also cause us to mistake interest for capital. Certainly in fisheries, people have often feared for the safety of the breeding stock of fish — the natural capital — when all that had happened was that the natural interest was not as it had been formerly. There, we needed to alter the management so as to increase the magnitude of the annual natural increase, compared with the expenditure of money necessary to take it. In other words, the money profit depends on bionomics as well as on economics. In other situations, the natural capital itself can be increased, as when a breeding stock is improved genetically, or a marsh drained.

As well as understanding the animal and plant kingdoms, we also have to take account of the nature of men. In fisheries, the catchers, merchants and consumers, all have characteristics that are known only vaguely, which yet govern the magnitude of those fisheries in which biological factors are not limiting. It may safely be surmised that the characteristics of fish cultivators are not the same as those of fish-catchers. It may also be surmised that, whereas in none of the groups are all the present characteristics fixed and unalterable, certain characteristics will be found to be essential to the

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[1]United Nations, Scientific Conference on the Conservation and Utilization of Resources (UNSCCUR), Lake Success, New York, 17 August to 6 September 1949.

efficient prosecution of the métier in each group (1). We do not know which among these characteristics will prove to be permanent features of these groups, but we are sure that such characteristics must form a substantial part of any speculative conception of future fisheries. It may be that we shall always have to be aware that fish cultivation needs the culture pattern of the tender husbandman, that fishing needs men who like to stake their strength and skill not only against the elements, but against a law and order that is no longer that of hunters, that marketing needs acquisitiveness and the mental alertness that makes for quick decision, and that fish consuming needs a kind of self-indulgence that does not grudge the trouble of selection and preparation. However, those are mere guesses at present, written out only for the purpose of illustration.

If, now, we attempt to revise and develop the appreciation reached at UNSCCUR, and if, in doing so, we confine ourselves entirely to the biological side, we are evidently performing a considerable feat of abstraction. What we write will, in greater or lesser degree, show the fields in which development is practicable, provided the requirements of cultivators, catchers, merchants and consumers, can be met; and not otherwise.

That appreciation of the possibilities of fisheries development governed a recent article by one us (M. G.) in *Agriculture*, of May 1952 (2). Since that article was published the other author (G.L.K.) has participated in the preparation of the article which appeared in this *Bulletin* (3), and we have met and discussed some of the biological aspects of the problems which beset man's exploitation of the seas, and the rivers and lakes. Our discussions included those possibilities which, in another context, one would be careful not to overstress. In the light of the knowledge of FAO, we both now see, for example, that using plankton as food would be an extension of a practice already in use in parts of the East, where zooplankton is eaten. Electric fishing might become a technique of directing and restraining fish under special circumstances. Fertilization, instead of being thought of in terms of tipping enormous quantities of artificial fertilizer into the ocean, looks better as some eventual use of vast abyssal reserves of nutrients.

We have also the more humdrum task of revising in some particulars the chart of latent sea fisheries resources, prepared at the UNSCCUR meeting, and published in Volume VII of the Proceedings (4). The following paragraphs, therefore, are by way of being footnotes to the Bulletin article referred to, in order to show how the position of that article was reached from the position at UNSCCUR.

Basic Productivity

Latest advances in hydrobiochemical research obtain estimates that the basic productivity of the seas is in total equal to that of the land ;[2] if the productivity of inland waters is added to that of

[2]But on this, *see* the paper by Steemann-Nielsen in the *Journal du conseil* (5) with its bibliography, and the comment by Riley in the same journal (6).

e seas the total of aquatic production exceeds that of the terrestrial. his fact must have considerable bearing on our thinking about the nportance of aquatic resources in world food economy. But we must e cautious against any easy optimism that food supplies from aquatic sources could equal those from land resources. In the first place it readily admitted [*see* Riley (6)] that present estimates of aquatic roductivity are based on an insufficient range of data.

For instance, there remains the very important task of measuring he productivity of tropical waters. It has for long been held that his is low, the evidence for this view being in part the smallness of lankton catches and, in part, the seeming smallness of the fish catch. lowever, research workers in recent years have begun to query this iew (7). Those who favor the idea that the tropical waters are more roductive than we had thought, base their view on two principal rguments. Firstly, they point out that, since the higher temperatures f the tropical waters result in higher rates of metabolism, biological rocesses are accelerated, shortening the life cycle. There would, in onsequence, be many more crops per unit period of time in the ropical waters than in the temperate, so that the total crop for a eriod of time might, in fact, be higher, in the tropical waters, than n the temperate. The biological accounts of tropical waters furnish great deal of evidence on accelerated biological processes, with very apid development of eggs and larvae and many instances of surprisngly short life spans. The other argument relates to the commercial atches taken in these waters (8). Phenomenal catches are taken in ertain places within the Tropics, such as the mouth of the Rokan River, (Sumatra, Indonesia), sometimes the Indian west coast, the Galapagos Islands (tunas), and the Mexican Gulf (shrimps).[3] Furthermore, although the tropical waters contain no concentrations of clupeoids of magnitude similar to those of the North Sea herring, nor of demersal stocks such as the gadoids of the Arctic, nevertheless, along the Asian coasts there are a great many fishermen each of whom consistently throughout the year takes a small daily quota of catch. In total, their operations yield considerable quantity of fish obtained by very simple methods.

The problem of tropical productivity is a special instance, albeit one of great extent and importance, of the more general phenomenon of variations in productivity, from place to place and from time to time. A major factor is, of course, the concentration of nutrient salts in the surface layers of water where they may be used by the plant life, and, as discussed by Professor Sverdrup in this *Bulletin* (9), those situations are most productive where the surface nutrients can be replenished from the stores in the depths and on the sea floor.

There are several areas where such replenishment takes place by the action of natural upwelling currents and where production is very great,

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[3] Mention in this sense must also be made of the guano deposits of the Chilean and Peruvian coasts while noting that this is a special case associated with the effects of the Humboldt current.

but, by the same token, there are areas where the replenishment is poor and others where it is virtually nil. Much has yet to be done to map the waters of the world in respect of their productivity and to analyze the systems of which the productivity is expression.

Whatever may be the conclusion about natural and basic productivity of the waters of the world, consideration must be given to the levels to which this productivity might be brought by artificial fertilization. Already much is done by manuring to improve production in ponds and other enclosed bodies of inland water, and it is obvious that a great deal more could be done by an intelligent program of aquiculture closely integrated with agriculture. It is insufficiently recognized that there is an almost physiological relation between the waters of, say, a pond and the earth, which forms its basin and surrounds it [*see* (10) for the hydrobiochemistry of this relation]. The productivity of a pond is, to a very large degree, determined by the nature of the soil of its bottom, and by the richness in nutrients of the land drainage water that reaches it. There is, thus, constant exchange of materials from land to the water, and *vice versa*. This exchange can be greatly increased by the use of manures or other vegetable wastes as fertilizers in the pond, with the complementary increase in, possibly, the transfer of aquatic plants as green manure for the land, and of course, the harvesting of the fish. Experience with such highly developed systems has shown that a relatively high production can be obtained from inland waters (11) and, although it is important not to overlook the cost element of such artificial fertilization, it is clear that a greatly increased fish production can be obtained from inland waters.

In turning to the seas, the problem of fertilization is much more difficult. Experiments have already been carried out in partially enclosed arms of the sea and the results have, of course, confirmed what was expected : that subject to certain conditions the basic productivity could be increased (12). But the difficulties of preventing wasteful dispersion of the fertilizer are very great. It is fairly certain that at some stage, not too far distant, it will be possible to use our knowledge of the dynamics of some of these systems in such a way as to exploit the concentrative effects, and to avoid the dispersive effects. For instance, a measure of success has been obtained in some special fertilization of estuarine mud flats where there is oyster cultivation (13). In such situations, the hydrological regime possesses conservative properties and holds the artificial fertilizer within the zone of interest.

On a much larger scale, it seems not altogether inconceivable that some of the great nutrient resources of the abyssal regions[4] might be brought back into circulation by artificial means, such as the use of atomic power or thermal energy to create artificial currents which, sweeping up submarine canyons, would carry nutrient material from

[4] *See* the comment by Cooper and Steven on the Loch Craiglin experiment, referred to in (12), and the correspondence thereon (14).

the depth to the surface. It would be necessary to ensure that such upwellings took place at situations which were sufficiently seeded with the necessary biota, and in which the conditions were favorable in other ways.

Productivity of Animals

The quantity of animal tissue produced per unit period of time per unit area or volume, is, in the academic sense, secondary productivity. Although it may be inferred with confidence that the level of animal productivity of any particular area is governed by its level of basic productivity, it is by no means easy to trace the relationship. Thus, we know that certain demersal grounds seem naturally overcrowded, and other grounds naturally under-populated (15). Those are comments on standing crops, not on annual production, and reveal one of the main difficulties of relating the two levels of productivity in areas that have not been specially investigated. We also know that the higher links in the food chains are subject to factors other than those which determine, in any particular area, the level of basic productivity, and that populations which constitute these higher links may have fluctuations in production which are independent of those of the primary links. These fluctuations manifest themselves as poor and good years in brood and fishable stock. [5] It would seem, therefore, that we should gain an important accession of power if we could determine more accurately the dynamics of the populations of the different links of these chains, and, having measured the relations between these links also their degree of independence, could at times intervene. These possibilities of intervention, discussed below, require many years of study, or of small-scale trial. In the meantime, it might be thought that indices of secondary productivity of the seas could be obtained from commercial catches. This, however, cannot be done on a wide scale. Apart from the disturbances caused by economic factors in commercial fishing, there are two simple difficulties. One is deciding what is the area within a geographical feature, such as an open sea, really inhabited by a stock of fish. That area has to be measured in order to give an estimate of weight of fish taken per square kilometer. The second main difficulty lies in availability to capture. If, for example, we attempted to use, as indices of secondary productivity, Galtstoff's figures given in Rounsefell and Everhart's recent book (16), we might conclude that partially enclosed seas, such as the Sea of Azov, are naturally more productive than open seas, such as the Barents Sea. This would illustrate both the difficulties mentioned : enclosed seas are easier to define and measure ; and they also tend to enclose the fish by topography, thus initiating concentration of fish, which is the key to most, if not all, fisheries at commercially paying levels.

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[5] The literature on this question is now voluminous, beginning with Hjort's classic study (17), through Thompson's studies on Haddock (18), to the annual compilations by the ICES (19).

Nevertheless, study of commercial catches may, with care, serve to indicate the level of secondary productivity, and thus to guide an investigator's attention to features of the sea, characteristic of high potential production, which in turn may cause him to look to other areas with the same features, even though those areas are at present unexploited. Such features include the oceanographical conditions and the composition of the stocks of fish. In the present situation, where various nations have turned their attention to the possibilities of exploiting marine resources, there is a need for some preliminary guides to the planning of exploratory and developmental work.

Resources from which Greater Productivity could be Obtained

At the UNSCCUR Conference there was general agreement that there are major resources of staple fish that at present are not fully exploited. It was agreed that more cod could be taken from the Arctic, North Atlantic and North Pacific grounds. It was also agreed that more clupeoids (herring, pilchard and menhaden) could be taken from all the seas of the world. Again, it was agreed that the tunas are generally under-exploited, especially in the broad open spaces of the principal oceans ; that more hake could be taken, especially off the southern coasts of the three continents of the Southern Hemisphere ; that ground fish could be taken off Africa and more redfish in the North Atlantic and North Pacific. Finally, the name " Carangidae " was written across the Indo-Australian archipelago.

In the preparation of the UNSCCUR chart, it was decided to omit the possibilities of inland fisheries and fish cultivation, which did not lend themselves to graphical representation, and which received ample emphasis in the text and in particular in the account given in plenary session by the reporter of the Fish and Wildlife Section, when seaweeds also received mention. (The plenary meetings are reported in the first volume of the proceedings of that conference.) The same reason led to their omission from the map which accompanies the article in *FAO Fisheries Bulletin* (3). Nevertheless, their importance is great, perhaps even greater than has yet been estimated, and the possibilities of securing effective development of these resouces are, in many cases, much more easily realizable than those of the marine resources.

The use of the term " trawling " off the east and west coasts of Africa, and of the term " Carangidae " across the Indo-Australian archipelago, directs attention upon an important question in this field. Throughout the tropical regions are to be found great areas of reef and coral bottom which seem to offer good prospects for fishing (20). The fauna on these grounds is chiefly Percomorph and the Carangidae are a very characteristic element. Numerous efforts have been made to trawl these grounds, but with success in only certain special cases, as for instance, the Wadge Bank, off the tip of the Indian Peninsula (21). Fishing by other methods is, however, often very productive

d perhaps further innovations in fishing method, supported by appropriate economic and other means, would make it possible to bring out more effective exploitation of these undoubtedly extensive resources. [6]

We agree that aquatic resources of the world are only partially ploited. UNSCCUR emphasized that this is true, even in terms of h proper, which, in most parts of the world, form a more promiig and valuable possibility than do other types of plants and anials. However, other types of plants and animals may serve as od for man, either directly or indirectly, and many of them are at esent relatively neglected. Mention may be made of both seaweeds d plankton as human food. It may be pointed out that these e already important food items in certain parts of the world. In e East some seaweeds are used as vegetables in exactly the me way as land vegetables are cooked and eaten. Other seaweeds e processed to be used for cooking as, for example, in confectionery, d in canning certain meats. But it would be difficult to forecast e ways in which seaweed might be used in the future. As for ankton, although the idea of using phytoplankton seems to correspond to a proposition to eat grass, the true proposition might be hat phytoplankton should be used to augment the foodstuffs for omestic animals. However, phytoplankton often includes poisonous bstances, as indeed may grass, and it may in the end turn out hat utilization of phytoplankton will continue to be by way of those nimals adapted by evolution to effective collection, selection and nversion of the phytoplankton. [7] The zooplankton might, in general, rove to be too dispersed and to lie out of reach of practicable ethods for their collection; but where this is not so, as happens in arious situations in the East, direct use can be made of this resource.[8]

Biological Contributions to Improved Fishing

Although in the foregoing section we have touched on some of ne more remote possibilities of increasing the yield of food and raw naterials for human use, it should not be thought that these have een mentioned because of any fear that more realistic possiilities seemed to be inadequate. At the beginning of the last section e referred to the immediate prospects of taking greater quanities of fish of the types caught at present, and it is proper now o consider the contributions which biology could make to improvenents in existing fishing operations.

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[6] This work will begin with an appraisal of local methods [*see*, for instance, Burton (22) and other papers in the *Proceedings of the Indo-Pacific Fisheries Council*] nd will analyze the efficiency of certain Japanese fishing methods (23).

[7] We do not overlook the implications of recent developments in the culture of *hlorella* (24).

[8] The raw material of the pastes and sauces made in the East is neritic macroplankon, or perhaps micronekton; it might be difficult to be precise in a distinction etween the two. These products are made from Burma through to the Philippines; e think there is some manufacture of them in southern East Pakistan, at Cox's Bazaar nd Akyab; there is some in Malaya, much in Indonesia, in Thailand on the Gulf f Siam, in Viet-Nam and in the Philippines. Plankton is caught also in Japanese, nd presumably, Chinese, waters.

For certain fisheries, and at present tentatively, fisheries biology can predict the pattern of distribution of the fish (25).[9] When perfected, such predictions could guide the fishing fleets to the location of the fish and thus reduce their searching time. In certain other fisheries, fisheries biology is beginning to describe the behavior of the fish and to predict that behavior on the basis of observations of environmental factors (26). When perfected, that knowledge could assist the fishermen to place their gear in the best position from which to catch the fish, and moreover, the description of behavior would contribute substantially to devising and improving equipment for finding and catching fish (27).

Important advances have been made in recent years in our formulation of the theory of fish populations and the effect upon them of fishing operations.[10] It has been possible to offer mathematical expressions for the relations between the most important elements of these systems and the way has been opened up for research which would realistically measure the nature and intensity of the effect of each factor. One of the important needs at this juncture is for study of the physiology of fish nutrition (28), which should then integrate, on the one hand, with the ecology of the fish food supply, and on the other, with the general account of its development and growth. A corresponding study is required of the nature and causes of natural mortality. For example, recent work has suggested that the incidence of disease among natural fish populations is much greater than had been suspected (29) : we might not be able ever to prevent such disease of fish in the sea, but understanding and evaluation of what may be a large factor is necessary, if other studies of mortality are not to be somewhat out of proportion.[11]

In a few fisheries, the fisheries biologist confidently predicts, at least approximately, the abundance of the species, and its variation from year to year (30). With experience, the operators concerned learn to adjust the fishing effort and handling effort to take a catch of the size and composition indicated.

The worldwide success of such biological participation — if, indeed, success proves possible in fisheries other than those in which the conditions have favored this participation — would revolutionize fishing, which should, other things being equal, greatly increase the yield.

Achievement of Fish Husbandry

In its principles, fisheries husbandry resembles animal husbandry on the land. In essence, animal husbandry protects the stock from

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[9]Major geographic changes have apparently taken place in recent years : for discussion of these, and generally of the relations between fish distribution and environmental factors, *see* (31).

[10]This is perhaps most notable in Beverton (32), Beverton and Holt (33), but *see also* Thompson (34), Burkenroad (35), Huntsman (36), and reviews such as Westenberg (37) and Vaas (38).

[11]Reference must also be made to work on external metabolites and the probability that they play a major role in community dynamics. *See*, for instance, Lucas (39). We have been informed that Swingle, of the United States, reported that reproduction appeared to be repressed in populations of high density and that he considered this to be due to accumulation of metabolites (40).

environmental extremes (droughts and floods, great heat and great cold), and from predators, ensures an adequacy of food and water, breeds better stock, and controls the numbers of the stock per unit area. In inland fisheries, especially in fish culture, practically all of these principles have been realized in intelligent practices, and many of them also have been at least attempted for wild populations in the open systems of rivers and lakes – often quite unnecessarily. In the vastly more open systems of the seas, the corresponding arrangements may or may not be practicable – certainly not for many years to come. The concept of optimum catch belongs to a much less close control, corresponding to game management rather than husbandry. Nevertheless, it introduces the principle of control of average population density, and with this comes even more direct control on density such as has been accomplished experimentally by transplantation of plaice in the North Sea. Again, the use of electricity for guiding and controlling the movement of fish seems to have possibilities in this sense: at the very least, to draft fish within partially enclosed arms of the sea, such as fjords, and to hold them there. In culture, including shellfish culture, even traditional methods approach land husbandry; it is difficult to picture the same régime applying in the stormy and trackless open seas, but it may prove possible.

Conclusion

The foregoing paper is by way of being biological footnotes to the article "Improving the Fisheries Contribution to World Food Supplies." That paper concluded that food production from the waters of the world could be increased by a definite amount in a given time. These footnotes mention and discuss some of the relevant biological arguments. They expose the need for further research on important factors and systems; but the immediate limitations to further progress do not lie with the biological factors. The biological factors would allow a very much greater expansion than is likely to be realized in the near future. There can be little doubt that the pace of development will be set, at least for the immediate future, by the human factors, cultural and economic.

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INLAND FISHERIES IN ISRAEL[1]

Israel is confronted with many difficulties in securing the supply of animal protein for its population of 1,600,000. In a recent agricultural plan, allowance is made for a protein consumption of 78.1 gram per caput per day, of which 25.3 grams are to be of animal origin. The animal proteins are expected to be supplied by meat (3.5 grams),[2] eggs (2.8 grams), fish (6 grams) and milk (13 grams). About 30,000 metric tons of fish would be needed to provide 6 grams of fish protein per caput per day for the present population and it is thought that of this ponds would furnish 6,000 metric tons, lakes and reservoirs 2,600 metric tons and sea fisheries 21,400 metric tons. Since the population is expected to increase to 2 million during the next few years this supply must increase by 25 percent to 37,500 metric tons.

In recent years the consumption of animal proteins amounted to 30 grams per caput per day in 1950/51, when more meat was available; to 23.6 in 1951/52 and approximately 24 in 1952/53. However, since local resources of animal proteins (cattle breeding, poultry and fisheries) are inadequate to meet the demand, the necessary level could be maintained only by large imports which, in the case of fisheries products, amounted to some 14,000 to 18,000 metric tons net per annum during the last four years. These imports place a great strain on Israel's foreign currency budget, in connection with which many financial difficulties are encountered.

Israel is engaged in sea fisheries from which the production in 1951/52 was 2,342 metric tons; and in inland fisheries with a production of 5,291 metric tons in 1951/52. Thus, it will be noted that, according to the above-mentioned plan, sea fisheries landings must be increased by more than nine times present production, and inland fisheries by a further two-thirds. It is certainly possible within a short time to increase inland fisheries production to the extent planned, but the increase of the sea fisheries contribution presents a serious problem. It should be understood, however, that these plans have been laid as part of over-all plans for land and water use; the demands for other requirements, essentially for other food crops, direct attention strongly towards marine resources. The Government, therefore, is endeavoring to increase sea fisheries landings by developing deep sea fisheries in the Atlantic and possibly in the Red Sea.

Inland fisheries include management of natural inland waters, exploitation of irrigation reservoirs, and fish culture in ponds.

The first, the natural, inland waters, include (1) Lake Tiberias which is the main source of natural inland fish, its production in 1951/52 being 953 metric tons fresh fish; (2) Lake Huleh whose production in 1951/52 was 152 metric tons fresh fish, but which it is planned to

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[1]By A.E. Hofstede, FAO/ETAP Fish Culturist, who has recently completed his assignment in Israel.

[2]These figures refer to protein as such and not to the foodstuffs which furnish the protein.

drain in connection with the construction of irrigation works and land reclamation, and (3) rivers of which the River Jordan, whose production in 1951/52 was 25 metric tons fresh fish, is the most important. The total production of these inland waters amounted to 1,130 metric tons, which represented 14.8 percent of Israel's total fish production, in 1951/52.

The exploitation of irrigation reservoirs is a new enterprise in Israel. these reservoirs now being constructed according to the Government Irrigation Scheme.

It seems unlikely that the production of these lakes and rivers could be substantially increased, but such increase as may be possible will come entirely from Lake Tiberias. since Lake Huleh's production will cease when it is reclaimed. Thus, the management of Lake Tiberias is a major item of the inland fisheries problems. Provided the rivers and lakes production of 1,200 metric tons can be maintained, then 1,400 metric tons must be obtained from reservoirs to meet the 2,600 metric tons target. It will depend on the area and the exploitation system whether it is possible to reach this goal. If a " pond exploitation " system with a production of 1,000 kg. per hectare, were possible, an area of 1,400 hectares would be needed. In many cases, however, such reservoirs cannot be drained, and for this and other reasons the most efficient pond culture practices cannot be used ; much lower production which cannot be expected to exceed 100 kg. per hectare per year will result and an area of 14,000 hectares would be needed. It is evident that the time required to bring the production from reservoirs up to 1,400 metric tons will depend on the exploitation system adopted and on the speed with which these reservoirs can be constructed.

Israel's fish culture in ponds is devoted chiefly to the growing of common carp. Its contribution to the total production of fish amounted to 4,161 metric tons or 54.5 percent in 1951/52. With a production of 1,600 kg. per hectare, an area of 3,700 hectares would be needed to produce the amount of 6,000 metric tons planned. The pond area was 3,400 hectares at the end of 1953. It can be expected, therefore, that pond production will attain the planned level within a short time by expansion of the area and improvement of the management.

The main tasks in Israel's inland fisheries program are :

1. The management of Lake Tiberias.
2. The exploitation of irrigation reservoirs.
3. Improvement of pond management.

The area of Lake Tiberias is 16,700 hectares. Due to various circumstances, such as climatic conditions, topography (210 meters below sea level), the existence of hot and saline springs, Lake Tiberias has peculiar characteristics due to which it cannot be classified in usual systems. Although many investigations have been carried out in this lake, an integrated biological and limnological study has never been completed. It is considered of prime importance that such investi-

gations be carried out especially since the characteristics of this lake may change appreciably as a result of the construction of big irrigation works by which fresh water, which now supplies the lake, will be partly cut off and salinity will rise.

By far the most important fish species are *Acanthobrama terraesanctae* Steinitz and *Tilapia galilaea* Art. which contributed 72.6 and 18.1 percent respectively to the 1951/52 landings. The other economic species are mainly Cichlids and Barbus. With the exception of *Acanthobrama*, all economic fish species are protected by laws prescribing minimum sizes. This protection includes two predators, *Barbus longiceps* and *Clarias lazera*. Fishermen and boats are licensed. Problems regarding Lake Tiberias pertain mainly to research and management.

The production from the lake averaged 300 to 350 tons per year before the Israel/Arab war. After 1948, the Israelis intensified fishing in the lake by increasing the effort and by introducing modern methods. A rapid increase of landings was the result: 681 metric tons in 1950/51 and 953 metric tons in 1951/52. These results prompt the enquiry : could production be increased further, or is even the increase so far a danger to to the stocks ? The investigations, which are therefore recommended, should include population studies based on modern theories. The present mesh size regulations are based on studies in the early 1940's and stocks, except *Acanthobrama*, are protected by allowing all the fish to reach maturity. Perhaps this is excessive protection. In addition, it is desirable to consider abolition of the protection of predators and to enforce laws regulating the catch of *Acanthobrama*, landings of which substantially increased after 1948. The average yearly production of 250 metric tons prior to this year increased to 692 metric tons in 1951/52. It is held by some that the first signs of overfishing have already appeared.

Exploitation of the irrigation reservoirs presents problems relating primarily to the exploitation system to be practised and to the fish species to be grown. However, it is by no means clear that the advantages of exploiting the fishery possibilities of these waters are fully appreciated. Efforts must be made to ensure that this appreciation develops in responsible quarters and that appropriate provision for fishing development is made in all plans for the construction and management of the reservoirs.

Pond culture was being practised, and some varieties of *Cyprinus carpio* had already been introduced in the early 1930's, but it was not before 1939, when Jewish settlers took up this enterprise, that rapid expansion over all the country took place. The area amounting to 15 hectares in 1939 increased to 3,400 hectares by the end of 1953, while the average production per hectare per year increased from 900 kg. in 1939 to over 1,600 kg., during which period 1949/50 was a peak year with an average production of 1,760 kg. The year 1951/52 showed a decrease to 1,480 kg. The main condition favoring this high production was the length of the period (8 to 10 months of each year) during which optimal temperatures between 25° and 30° C.

prevail. Moreover, the Israelis developed an intensive enterprise which includes application of artificial fodders and chemical fertilizers. Carp culture has been, and still is, of inestimable value since, for instance, it could be practised in situations with soils and water, which, on account of high salinity, high calcium content or high water table, were unsuitable for agriculture. Furthermore, this practice contributed to the de-salting of saline soils.

Figure 3. Distribution to fish farmers of carp spawners and miltus grown and selected by the Fish Breeders Organization in the Beit Shean Valley, Israel.

At the present time, the Government faces great difficulties which threaten further extension of fish culture. These pertain mainly to high foreign currency expenses involved in the purchase of fodder from abroad because local supplies are inadequate, and to heavy losses due to the poisoning effect of a flagellate *Prymnesium parvum*. The excellent researches carried out by scientists of the Hebrew University, working in close co-operation with the Fish Breeders Association have already yielded valuable biological information on this organism and have indicated the methods according to which it can be controlled. The currency difficulties probably could be solved by a consideration of management practices which would put these on a much more economic basis. Although production is already very good it is still worthwhile to consider whether further increase of production could not be obtained. The most important means by which production could be increased include improvement of management, mainly with regard to treatment of the soil, manuring and fertilizing ;

weed control, selection of better carp strains, and introduction of fish species which utilize food not used by carp. The Government has already started experiments with imported and indigenous fish species. Punten carp (which is a variety of *Cyprinus carpio*, selected in the former Dutch East Indies), *Ctenopharyngodon idellus* and *Catla catla* were introduced in 1952 under FAO sponsorship by two Israeli workers on FAO/ETAP fellowships. The original Catla stock died on account of a fish disease not previously observed in Israel, but a further supply of this fish was imported by the Government in 1953. Good results were obtained in practice with the growing of *Mugil*, and research in respect of the supply of fry has been started.

Culture of *Salmo irideus* (rainbow trout), which was formerly imported, had to be abandoned because of difficulties in providing for artificial feeding with animal proteins ; on the other hand, experiments with *Tinca tinca*, whose growth has hitherto not been favorable under the conditions prevailing in Israel, are being continued. The indigenous fish *Tilapia galilaea* and *Tilapia nilotica* are being studied now ; the latter also occurs in Lake Tiberias, but is probably a local race of inferior quality.

Israel lacks fish species which feed on plants. *Ctenopharyngodon idellus* is suitable in this respect but its propagation is so problematical that it is doubtful whether it can be of sustained value to Israel. The Government has been advised to introduce *Tilapia melanopleura* in this connection. The search for suitable species must continue because it is of importance to check weeds some of which, such as Typha and Phragmites, are a real plague in some areas.

Mention must be made of the fact that of the above-mentioned fish species some do not propagate in common ponds : these include the exotic *Ctenopharyngodon idellus* and *Catla catla* and the indigenous Mugils. Since all of these seem to be very promising as cultivable species for Israeli ponds, their propagation is important ; the Hebrew University has started experimentation on hypophysation as a means of inducing propagation.

Israel's inland fishery enterprises have been developed to high technical levels. It certainly seems possible to effect improvements, but it must be understood that these cannot be realized overnight. Scientists and fish farmers must bear in mind that every fish species has its particular characteristics and habits which often differ in many ways from those so familiar and well developed for the common carp ; and that, consequently, principles which hold true for common carp might not be applicable to other fish.

FISH CONSUMPTION CAMPAIGN IN CHILE: FAO/ETAP COURSE OF LECTURES

During the first week of November 1953 a series of lectures was delivered at the University of Chile, Santiago, dealing with the various aspects of fish consumption problems in Chile. The series marked the conclusion of an FAO/ETAP project conducted by John Fridthjof (Denmark) who, for the past two years, has been assisting the Chilean Government to organize and carry out a campaign to improve the level of fish consumption in Chile, especially among the lower income groups in rural areas.

The course of lectures was sponsored by the Ministries of Education and Agriculture with the co-operation of the FAO Sub-Regional Office for Western South America. The object of the lectures was to provide a brief review of consumer education work and related problems in fisheries with special reference to the continuing campaign in Chile. The 40 participants comprised representatives from the Ministries of Agriculture, Education, Public Health, Defence and Labor, together with local government officers from the Price Regulation, Statistical and Food Inspection Services. Sixteen lectures of one hour each were delivered during the first four days. On the fifth day visits were paid to the larger fish markets in Santiago, and on the last day a trip was made to Valparaiso in order to visit the Head Office of the Department of Fish and Game, the Marine Biology Station, a fish freezing factory and the fishing harbor.

The series was introduced by Dr. B. F. Osorio-Tafall, FAO Regional Fisheries Officer for Latin America, who delivered a lecture on "The World Food Situation and the Existing Fishery Resources." The series comprised, first of all, a number of lectures on general lines as follows:

"The Need of Animal Protein in the Diet," by Virginio Gómez, co-responsible for the work of fish consumption in Chile.

"The Fishery Resources of Chile," by Dr. Edwyn P. Reed, Technical Adviser, Department of Fish and Game.

"Fishery Biology Research," by Dr. Parmenio Yáñez, Director of the Marine Biology Station, University of Chile.

"Fish Production Methods in Chile" and "Fish Industrialization and Distribution in Chile," by Antonio Bories, Chief, Technology Section, Department of Fish and Game.

"Fish Sanitation in Chile," by Dr. Bernardo Poloni, Technical Adviser, Department of Nutrition, Ministry of Public Health.

"Price Factors Influencing the Retail Costs of Fish," by Julio Morales, of the Commissariat for Food Supply.

"Availability of Daily Statistics of Supply, Quality and Prices-Consumers Survey," by Moisés Hernández Ponce, Director, Department of Fish and Game.

" Fish Cooking Techniques, " by Clara Acuña Rios, Ministry of Education.

These were followed by a number of lectures dealing with the various pilot projects which have formed part of the campaign :

" The Santiago Merluza Campaign, " by Commander Julio Luna, General Manager of Cía. Pesquera " Arauco " and Chairman of the Chilean National Fisheries Society.

" Fisheries Extension Service, " by Marcelo Montt, Legal Adviser to the Department of Fish and Game.

" The Aconcagua Rural Campaign, " by Carlos Salomón, Provincial Chief, Public Health.

" The Consumers Education at the Health Center of Cerro Barón, " by Minerva Malic, Nutritionist, Ministry of Public Health.

A lecture then followed on " Fish Working Units in the Public Schools, " by Domingo Valenzuela Moya, Chief of the Technical Department of the Ministry of Education. This lecture referred to work carried out by school children of 4,000 primary schools all over Chile and was followed by a visit to the Ministry of Education to study

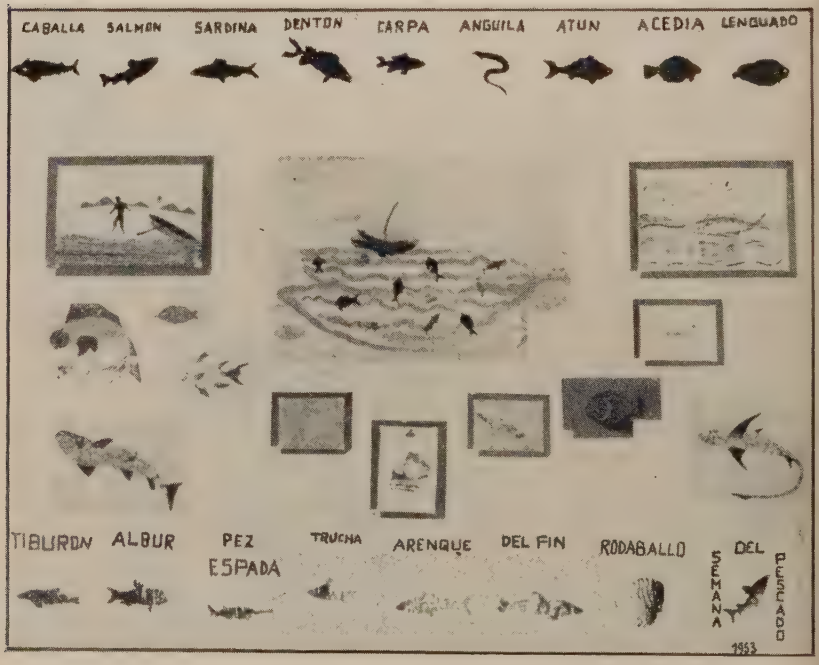

Figure 4. Display of posters by children as part of a campaign by FAO to increase fish consumption in Chile.

an exhibition of children's work consisting of paintings, drawings, models, essays, etc., based on the production, processing and distribution of fish and illustrating its nutritional and economic importance. A variety of fish dishes were exhibited with an explanation of their costs and nutritive value as calculated by the children.

Finally, John Fridthjof, a FAO/ETAP expert, gave a lecture on " The Organization of a Fish Consumption Campaign " and Horacio Rosa, Jr., Assistant FAO Fisheries Officer for Latin America, lectured on " FAO Fisheries Activities. "

The lectures were followed in each case by discussion and it was evident that considerable interest had been aroused by the series. The fact that many of the lectures were delivered by government officers, who had themselves co-operated in the campaign, provides some measure of the success of the FAO/ETAP project and indicates the extent of the Government's interest in consolidating and continuing the campaign.

Conferences and Meetings

FAO Conference

The Seventh Session of the FAO Conference met in Rome, from 23 November to 11 December 1953. A special panel of fisheries experts was appointed to discuss the work of the Fisheries Division and to report back to the Conference. A. W. Anderson of the U. S. Fish and Wildlife Service acted as chairman of the panel, and C. Ravel, Ministère de la marine marchande, France, as vice-chairman.

The Conference reviewed the work carried out in the field of fisheries during 1952 and 1953, and examined the program for 1954 and 1955. It was noted that an extended description of the rationale on which the program is based is given in an article published in the *FAO Fisheries Bulletin* Vol. 6, No. 5, September/October 1953, entitled " Improving the Fisheries Contribution to World Food Supplies. " The Conference considered this document to be valuable to Member Governments and to the fisheries industries and services throughout the world and the hope was expressed that it would be reprinted in both the scientific and the trade journals devoted to fisheries. The Conference commended the Director-General on the implementation of the program to date and expressed the view that it had contributed materially to increasing the world's supply of animal protein and other foods. It recognized the difficulties – and noted the impossibility in many respects – of measuring in precise figures the increase attributable to the work of the Organization, but the hope was expressed that by the next Conference some progress would have been made in overcoming these difficulties. The Conference wished to draw special attention to the following aspects of the program of work for the next two years.

Fisheries Biology

Work in fisheries biology in 1952 and 1953 was carefully reviewed. The Conference considered that there were two phases of activity in this field which could contribute tangible results in a short time towards relieving shortages in protein deficient areas, namely, the improvement of fish culture practices and the management of inland fisheries. Experience in these areas indicated the urgent necessity for the continued guidance to Member Governments in their management programs.

The Conference noted the series of events which had led to the under-staffing of biologists responsible for this section of the program and considered it of the utmost importance that the establishment should be brought up to full strength as soon as possible. The Conference emphasized the value of the preparation of a world series of fisheries maps in connection with the Survey of Marine Resources and suggested that this work should be given full priority.

The Conference recognized the importance of the development of fishery surveys which are of interest and benefit to all nations. It considered that the development of an international approach to this very important subject might best be advanced by action initiated by the Organization with a view to international co-operation in the conduct of survey operations especially in unexplored areas. It was accordingly recommended that proposals for such international action should be placed before the Meeting on Fishery Resources, which it is proposed to convene in 1955.

Fisheries Technology

In examining the program of work for fisheries technology, the Conference commended the procedure which has been followed of bringing together experts and technicians in international meetings, as, for example, in the recent successful Fishing Boat Congress held in Paris and Miami in late 1953. It was gratified to learn that the Congress report, the first of its kind, would be published in 1954. The work of co-ordinating and stimulating continued research on fishing boats, especially on the subject of sea behavior, and of consultations on hull design and small boat mechanization was considered most valuable. The co-ordination of the work of fish processing technologists through the FAO Interim Committee on Fish Handling and Processing was found most effective. The Conference noted with satisfaction that the full report on the FAO Meeting on Herring Technology (Bergen 1950) had been published by the Norwegian Directorate of Fisheries under the title "The Technology of Herring Utilization." The continued collaboration with the Nutrition Division in the work of exploring uses of fish flour in human nutrition was highly commended.

The Conference considered that among the deterrents to fisheries development is the lack of general knowledge of improved types of fishing gear and its use and attached high priority to the work pro-

posed. The Conference emphasized that the present attention to the needs of particular regions for specialized technological advice should be continued, since only in this way can the work be most effective. *World Fisheries Abstracts* were considered to be a most valuable publication, well suited to the requirements of technologists everywhere. The Conference noted, with satisfaction, that the study on *Commodity Standards of Fisheries Products* had been augmented and published ; it considered it to be of great value to all Member Governments as a guide to legislation on fisheries commodities and fish inspection.

Fisheries Economics and Statistics

The program relating to fisheries economics and statistics was carefully considered and the close relationship of this work with that of the rest of the fisheries program was fully recognized. The Conference was of the opinion that member countries should do more to assist in the provision of comprehensive and detailed information and statistics in order to enable the work of FAO to be carried still further in this field. It emphasized that the solution of marketing problems and the organization of more efficient distribution arrangements were of an importance equal to increasing production, in view of the urgent need in many areas to provide the incentive for expanding fish production and consumption. It hoped that the documentation resulting from the Hong Kong Fish Marketing Training Center, to be held in 1954, would afford material assistance in this respect. The value of the *Yearbook of Fisheries Statistics* was stressed and it was considered desirable that the first opportunity should be taken to produce this work annually instead of biennially as at present ; it might further be improved by the provision of information on the sources of statistics available even if such source had not been used in the compilation of any particular edition of the yearbook.

The Conference considered that the time was ripe for the production of a brief guide indicating the simplest way of collecting the statistics and preparing them in the form most suitable for general use in the various countries, particularly those in which further development of fisheries statistics was needed.

Regional Activities

The Conference reviewed the program drawn up for regional activities. It was emphasized that where similar bodies are not already in existence fisheries councils provide an excellent means of establishing contacts between fishery experts and advancing the development of the fisheries in their particular areas. The difficulty of financing these councils with their extending activities was appreciated and it was considered that in the future the participating countries might reasonably be asked to contribute part of the costs incurred by the Organization in its role as Secretariat to these bodies.

FAO Fisheries Bulletin *and other Documentation*

The Conference took particular note of the progress which had been made in developing the *FAO Fisheries Bulletin*. It felt that an extremely high standard had been attained and it hoped that careful consideration would be given to every possible means of expanding the existing distribution. The Conference considered various proposals for further improving the content of the *Bulletin*; among these it was urged that wherever possible the more important papers presented in the course of meetings should be given the maximum publicity by reprinting them as articles in the *Bulletin*. It was also recommended that some space in every issue should be devoted to a short review of outstanding events of international significance. It considered that the *Bulletin* deserved the widest distribution and that the possibility of augmenting the circulation by reducing the price to outside subscribers should be explored. The Conference wished expressly to commend the Director-General on the high standard which had been attained in fisheries publications generally.

Expanded Technical Assistance Program

The Conference considered the action programs which are being conducted in various countries under the Expanded Technical Assistance Program. It noted, with regret, that all the assistance asked for could not be rendered under the limited budget, but nevertheless congratulated the Director-General on the results achieved. It recognized that the work was closely co-ordinated with that at Headquarters and that the success achieved to a great measure was dependent upon the background of experience which was brought to bear by the Headquarters staff. It hoped that Member Governments could be informed by the Organization of technical assistance reports on fishery matters which could be released from the restricted category for distribution, as in this way much useful information could be derived by countries with similar problems.

Oceanographic Research Program for the Indo-Pacific

The United Nations Educational, Scientific and Cultural Organization (UNESCO), in collaboration with FAO, and acting on a resolution adopted at its seventh conference, convened a meeting of consultants in Manila, in the Philippines, 12 to 13 November 1953, who were requested to consider the possible creation of an oceanographic organization in the Indo-Pacific region.

The meeting was attended by the following : Dr. J. D. F. Hardenberg, Head, Laboratory for the Investigation of the Sea, Djakarta ; Dr. Thomas G. Thompson, Department of Oceanography, University of Washington ; Dr. N. K. Panikkar, Chief Research Officer, Central Marine Fisheries Research Station, Mandapan, South India ; Dr. R. Serene, Director, Institut oceanographique, Nha-Trang, Viet-Nam,

Chairman of the IPFC; Prof. Theodore Monod, Director, Institut français d'Afrique noire, rue Cuvier, Paris; Dr. D. J. Rochford, CSIRO Division of Fisheries, Marine Biological Laboratory, Cronulla, New South Wales, Australia; J. A. Tubb, Reader in Marine Biology, Director, Fisheries Research Unit, University of Hong Kong; Boon Indrambarya, Director-General, Department of Fisheries, Bangkok, Vice Chairman, IPFC; Commander A. C. Hardy, Department of Zoology and Comparative Anatomy, University Museum, Oxford, England; Dr. John P. Tully, Pacific Oceanographic Group Nanaimo, B. C., Canada; Prof. Koji Hidaka, Faculty of Medicine, University of Tokyo, Japan; Dr. Tomoo Otaka, Japan; Dr. Anton Fr. Bruun, Zoological Museum, Copenhagen, Denmark; Prof. Hans Pettersson, Oceanografiska Institutet, Göteborg, Sweden.

Attending on behalf of UNESCO were Prof. Pierre Auger, Director, Department of Natural Sciences, Paris; Dr. Alexander Wolsky, Head, UNESCO Science Co-operation Office for South-east Asia, Djakarta; and Jan Smid, Head, UNESCO Science Co-operation Office for South-east Asia, Manila Branch. Dr. Cecil Miles, Secretary of the IPFC, of the FAO Regional Office for Asia and the Far East, represented FAO; M. J. Lobell, FAO Mission, Bangkok, and Edwin H. Dahlgren of the U.S. Fish and Wildlife Service attended on behalf of the Foreign Operations Administration (FOA), and Loring Hudson on behalf of the Pacific Science Association.

The meeting was opened by Prof. Auger. A statement was also made by Dr. Cecil Miles, and reports were presented by Dr. Wolsky and Dr. Rochford. After a full discussion and consideration of the material before it, the meeting prepared a report containing recommendations which will be submitted by UNESCO to a meeting of governmental representatives to be convened in 1954.

Indo-Pacific Fisheries Council

The 3rd Executive Meeting of the Indo-Pacific Fisheries Council took place in Manila, the Philippines, 10 to 11 November 1953. The following were present: Dr. R. Serene, Chairman; Boon Indrambarya, Vice-Chairman; Dr. Cecil Miles, Secretary; and Dr. D.V. Villadolid, Director of Fisheries, Manila. Dr. D. J. Rochford and Dr. J.D.F. Hardenberg acted respectively as chairman and rapporteur to Technical Commission I. Claro Martin and T. G. Megia acted as observers. The meeting reviewed arrangements for the fifth meeting of the Council, which will take place in Bangkok, Thailand, from 22 January to 5 February 1954.

8th Pacific Science Congress

The 8th Pacific Science Congress was held from 16 to 28 November in Manila, the Philippines. The Oceanographic Section held seven symposia, most of which were of direct interest to fisheries workers. These symposia were: Exploitation and Utilization of Products from

the Sea ; Marine Provinces in the Indo-Pacific Region ; General Circulation of the Pacific ; Pond fish Culture ; Ecology of Coral Atolls ; Productivity in Temperate and Tropical Waters ; Review of Problems, and a paper on the training of oceanographers.

International Fisheries Convention 1946[1]

The Second Meeting of the Permanent Commission set up under the International Fisheries Convention of 1946 was held in London in the second week of November 1953. Delegations attended from eleven of the Member Governments, namely Belgium, Denmark, France, Iceland, the Irish Republic, the Netherlands, Norway, Portugal, Spain, Sweden and the United Kingdom. Poland, the remaining Member Government, was represented by an observer.

At the invitation of the Commission, there were also present observers from the Government of Western Germany who said it was hoped that, subject to the approval of the Bundestag, Western Germany would accede to the Convention and join the Commission early in 1954.

Proposals were put forward by several delegations for the alteration of the provisions of the Convention (which are due to come into force on 5 April 1954), affecting the size of mesh of nets, minimum size of fish to be retained on board fishing vessels for landing and sale, and the extent of the waters covered by the Convention.

The delegates unanimously agreed that for a transitional period of not more than two years from 5 April 1954, the minimum size of mesh should be 75 mm. instead of 80 mm. in the waters for which 80 mm. is prescribed under Annex I of the Convention.

Having regard to scientific evidence about the difference in selectivity between seine nets and trawl nets, all delegates other than the Norwegian, who wished to give further consideration to the matter before expressing his opinion, agreed at the instance of the United Kingdom that the minimum mesh for seine nets from 5 April 1954, should be 70 mm. in the area for which the Convention at present prescribes a mesh of 80 mm., and 100 mm. in the area for which it prescribes 110 mm.

In relation to proposals submitted by the Danish delegation, consideration was given to the problem of fisheries for industrial purposes involving the capture of immature fish of species protected under the Convention. As a temporary measure pending further discussion at their next meeting, the Commission suggested that Denmark should make suitable arrangements for the regulation of this type of fishery, and meanwhile agreed to ask the International Council for the Exploration of the Sea for scientific advice as to the conditions under which such fisheries could be permitted without harm to the conservation of the species which the Convention aims to protect.

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1 Abstracted from the *Ministry of Food Bulletin* (London), No. 728, 14 November, 1953.

The Commission considered extending the area of the Convention southwards from 48° N Latitude to include the waters off the Atlantic coasts of France, Spain and Portugal. These countries agreed to consider the matter further among themselves and submit definite proposals to the Commission.

It was agreed that all countries should notify the Commission of the measures they were taking to enforce the requirements of the Convention and that consideration should be given at the next meeting to the question whether any further steps were desirable.

The Commission recalled the different interpretations which had been put upon the scope of their powers at their first meeting, and were informed that the United Kingdom intended to lay before all other signatory governments proposals for a revised Convention which would resolve these difficulties and so meet what was believed to be the general desire that conservation measures need not be restricted to the size of mesh of nets and minimum-sizes of fish.

The Commission accepted with pleasure an invitation from Denmark to hold its next meeting in Copenhagen in May 1954.

Fisheries Division Activities

International Fishing Boat Congress

In co-operation with the Fish and Wildlife Service of the United States Department of the Interior, FAO arranged an International Fishing Boat Congress in Miami, Fla., U.S.A. from 16 to 20 November 1953. This was the second session of a similar congress arranged in co-operation with the Ministère de la marine marchande in Paris from 12 to 16 October. (*see FAO Fisheries Bulletin*, Vol. 6, No. 6, pp.243-46).

Sixty-eight technical papers were submitted at the Miami session and a total of 114 participants from 17 different nations were registered. A representative from the United Nations Korean Rehabilitation Administration (UNKRA) was also in attendance.

The first day of the congress took the form of a joint meeting with the Sixth Annual Session of the Gulf and Caribbean Fisheries Institute opened by Dr. F. G. Walton Smith, Director, Marine Laboratory, University of Miami, Coral Gables, Fla., U.S.A., The participants were welcomed by the Hon. Thomas E. David, Speaker-Designate, Florida House of Representatives, Hollywood, Fla., A. J. Wegman of New Orleans, La., and Gove Hambidge, Representative of the Director-General, FAO, Washington, D. C. Commander A. C. Hardy, who was chairman of the Paris session, was elected chairman for the joint meeting of the first day. At the suggestion of Dr. Smith the election of officers for the Fishing Boat Congress was deferred until the first separate session.

On nomination of the U. S. delegation, the Congress elected H. C. Hanson, consulting naval architect, Seattle, Wash., U. S. A., chairman, and the following were elected chairmen of the individual technical sessions :

Boat Types	Commander A. C. Hardy, London.
Hull Shape and Sea Behavior	C. C. Nickum, Consulting Naval Architect, Seattle, Wash., U.S.A.
Stability, Safety at Sea	Enrique R. A. Carranza, Argentine Naval Commission in the U.S.A., New York.
Engines	R. T. Whiteleather, U. S. Fish and Wildlife Service, Washington, D.C., U.S.A.
Deck Gear	A. Labrie, Deputy Minister of Fisheries, Quebec, Canada.
Research Vessels	A. L. Prichard, Director of Conservation and Development Services, Department of Fisheries, Ottawa, Canada
Factory Ships	H. C. Hanson, Consulting Naval Architect, Seattle, Wash., U.S.A.

The papers, which had been distributed in advance, were summarized by rapporteurs in order to provide as much time as possible for discussions. Authors were given an opportunity to add to the rapporteurs' summaries. Several recordings of contributions made to the discussion during the Paris session, were transmitted to the participants in Miami.

Jan-Olof Traung, FAO naval architect, acted as rapporteur for the session on boat types and summarized 24 papers. The interesting discussion which followed centered on problems of general arrangement, construction methods, use of wood or steel, the advisability of using laminated wooden constructions and the question of beach landing craft.

E. R. Gueroult, consulting naval architect and representative of the French Government, acted as rapporteur for the session on hull shape and sea behavior. George G. Nickum, H. C. Hanson, Arthur de Fever, G. O. Huet, Howard Chapelle, W. C. Gould and J. O. Traung participated in the discussion. In conclusion, the participants urged FAO to continue its work in collecting the data on tank tests on fishing boats and to publish them in a uniform style for the benefit of fishing boat designers in various parts of the world. It was also stressed that FAO should encourage and co-ordinate research, especially on the subject of sea behavior.

Commander Leonard E. Penso, Merchant Marine Technical Division, U.S. Coast Guard Headquarters, Washington D. C., acted as rapporteur for the papers dealing with Stability and Safety at Sea. The lack of stability and safety regulations for fishing vessels under 50 ft. (45.8 m.) in the U.S.A. was the cause of a discussion regarding the advisability of introducing certain minimum standards for fishing boats. A special committee was appointed to study this problem further during the time of the Congress.

Commander A. C. Hardy acted as rapporteur for the engine and propeller section. The discussion was divided into two parts. During the first, users and operators and naval architects were invited to contribute and a number of speakers, among them I. Bromfield, East Boston, Mass., U. S. A., communicated their experience of engines. General opinion was divided on questions such as 4-stroke *v.* 2-stroke engines, slow-running *v.* high-speed types, engine types such as semi-Diesel *v.* Diesel, method of drive such as direct drive, Diesel-electric drive or controllable pitch propellers. During the second part of the discussion, in which engine manufactures mainly participated, information was given about the design and characteristics of high speed engines.

The papers on deck gear were summarized by Dr. Sidney Shapiro, U. S. Fish and Wildlife Service, and dealt with the use of hydraulics for driving deck winches, the use of a drum for hauling purse seines and the use of simplified containers for storing live bait for the tuna fisheries. The discussion centered on these items also on the experiences that had been gained in using electric drive for trawl winches.

R. T. Whiteleather, Deputy Chief, Branch of Commercial Fisheries, U. S. Fish and Wildlife Service, reported on research vessels and supplemented his report with information about the design and operation experiences of the Pacific coast research vessel *John N. Cobb*. Additional information about research vessels was given by G. C. Nickum, H. C. Hanson, Francis Minot, etc.

A special session was arranged with the subject "Development of Fisheries in Underdeveloped Areas." The discussions were introduced by Mogens Jul, Chief Technologist, FAO Fisheries Division, who compared the minute amount of money spent in technical assistance by all different agencies in the world with the expenses to build one single battleship. He made some general remarks about the difficulty of finding the right expert for the right place and discussed general experiences in the conducting of technical assistance programs in the past. Jan-Olof Traung added to Mogens Jul's remarks by giving some typical examples of FAO's work in the development of boats and gear.

The valuable discussion emphasized the necessity of not carrying out technical assistance programs faster than they can be absorbed by the receiving country and that only such methods or equipment should be proposed as had shown favorable results elsewhere.

Mogens Jul, FAO, reported on factory ships. He was rather doubtful of the immediate future of this type of fishing enterprise except in such conditions where distance from home ports make other types of operation impossible. He pointed out that while factory

ships could be made economically and technically successful under optimal conditions, there would always remain in use other kinds of fishing boats in varying sizes and that it was important not to consider factory ships as superseding other kinds of fishing boats. Commander A. C. Hardy, G. C. Nikum and I. Bromfield contributed to the discussion with experiences in their own field of operations.

During the congress a subscribed dinner was arranged to which participants to the Gulf and Carribbean Fisheries Institute meeting were invited. The International Fishing Boat Congress participants were correspondingly invited to the banquet given by the Gulf and Caribbean Fisheries Institute. The U.S. Fish and Wildlife Service arranged an excursion to one of their research vessels which was equipped with underwater television and participants were also shown the Marine Laboratory of the University of Miami. They were also invited to an economics session at the Gulf and Caribbean Fisheries Institute on the problem of financing fishing vessels.

The Congress adopted a resolution similar to that adopted by the Paris session, as follows :

Whereas the Miami session of the First International Fishing Boat Congress has taken note of the present state of experimentation and research in the design and construction of fishing boats, and in their safety and security in operation, and

Whereas it finds that these subjects deserve a common further study in order to avoid the dispersion of efforts and to facilitate the comparison of the results obtained,

Therefore it recommends that FAO should organize a permanent international co-operation on a wider basis with the effective assistance of the naval architects, marine engineers, boat builders, scientific societies and research and other Organizations of the interested countries, and that, for this purpose, a Provisional Committee for the Americas should be formed to instigate the necessary contacts and to organize and supply vital impetus to this co-operation.

The following were nominated for this Committee :

Chairman : H. C. Hanson (U.S.A.) ; Secretary : Wm. C. Miller (U.S.A.) ; Wm. S. Hines (Canada) ; Carlos Santa Maria (*pro tem* for Chile) ; Jorge M. Sanchez A. (Mexico) ; Howard I. Chappelle, Francis Minot, G. C. Nickum and Dwight S. Simpson (U.S.A.).

General Fisheries Council for the Mediterranean (GFCM)

The second meeting of the Council was held in Rome, 26 to 29 October 1953, under the chairmanship of J. le Gall, France. Dr. D.B. Finn, Director, FAO Fisheries Division, attended the meeting and M. Girard, FAO, attended in his capacity as Secretary of the Council. The opening session was addressed by S. E. Tambroni of the Ministry of the Italian Merchant Navy, Norris E. Dodd, Director-

General of FAO, and by the Chairman. The member countries represented were France, Greece, Israel, Italy, Spain and Yugoslavia. Observers were present from Monaco, which has already applied for membership, Lebanon and Turkey; G. L. Kesteven, FAO, acted as observer for the Indo-Pacific Fisheries Council. Fifty-two technical papers were presented, and the program of work for the next year reviewed. Professor Umberto d'Ancona, Italy, was elected chairman for 1954, while C.D. Serbetis and T. Soljan were re-elected as 1st and 2nd vice-chairman respectively.

Two further technical committees were set up – an Inland Waters Committee, and a Statistics Committee – and the following elections were made for all five committees:

Exploration Committee	President: J. le Gall (France); Vice-President: Umberto d'Ancona, (Italy). Rapporteur: G. Belloc (Monaco).
Production Committee	President: T. Soljan (Yugoslavia); Vice-Presidents: M. Shavit (Israel), A. Ferragut (Spain); Rapporteur: F. Villarem (France).
Utilization Committee	President: C. D. Serbetis (Greece); Vice-President: R. Dieuzeide (France); Rapporteur: B. Parac (Yugoslavia).
Statistics Committee	President: C. Solamito (Monaco); Vice-President: S. Zupanovic (Yugoslavia); Rapporteur: G. Bazzuoli (Italy).
Inland Waters Committee	President: Umberto d'Ancona (Italy); Vice-President and Rapporteur: R. Charpy (France).

A request for membership has also been received from Tunisia.

The next meeting of the GFCM will be held in October 1954, in Monaco, at the invitation of the Principality.

International Training Center for Fisheries Biology, Turkey

The Center was held from 21 September to 27 October 1953 at the Hydrobiological Institute, Baltalimani, Istanbul, Turkey, under the joint sponsorship of the Government of Turkey and the FAO/ETAP program. Nineteen students attended, of whom 17 were awarded certificates on the satisfactory completion of the course. They were recruited from the scientific staff of the Institute, the Meat and Fish Office and the Bureau of Fisheries of the Ministry of Economy and Commerce, the Army Corps of Veterinarians, and the Zoological Institute. There were two foreign students, one from the Fisheries Department of Israel, and the other from the Oceanographic Institute, Yugoslavia. Some members of the Hydrobiological Institute attended various courses as auditors.

The objective of the Center was to give training to certain research workers in practical fisheries biology and oceanography, and in the

investigation and development of marine resources. The curriculum included courses in fisheries biology and oceanography. Special emphasis was given to biometrics, and there were also supporting courses in fisheries technology, marine biology and general biology. There was laboratory and field work at sea appropriate to the lecture material, and film and discussion periods. Lectures were given by various members of the staff of the Hydrobiological Institute and of Roberts College, Istanbul, as well as by members of the FAO/ETAP fisheries team at present working in Turkey, and by instructors from the United Kingdom.

Zeyat Krom, Director, Fisheries Section, Meat and Fish Office, under nomination of the Government of Turkey, acted as Director of the Center, with Dr. G. A. Rounsefell, leader of the FAO Fisheries Mission to Turkey, as Associate Director.

Regional Fisheries Office for Latin America

Representatives of the United Nations Children's Fund (UNICEF) visited the Regional Office to learn about the fish flour project being carried on by FAO in Chile and to discuss the possibilities of UNICEF making use of this flour in its nutritional activities. It was explained to the officials of UNICEF that FAO looks upon this project as a long-term one, and that manufacture of the flour will in due course be made by a small-scale plant to be installed in Chile.

The first steps are being taken by the Institute of Pedagogy of the University of Chile, in collaboration with the technical staff of the FAO Regional Office, to organize a course for post-graduate students, during which the essential notions about the sea, its living resources and their uses will be considered. The four main topics to be covered by the course are : Oceanography, Marine Resources, Ecology and Biogeography, and Fisheries Science. It is planned to hold the course during the school year of 1954. Some of the courses will be delivered by the technical staff of the FAO Regional Office.

The University of Chile organized a series of 34 conferences which covered the civilization, agriculture, mining, industries, trade and natural resources of the country. Dr. Osorio-Tafall presented a paper on the "Chilean Resources, their Present Use and Potential Value."

The work of printing the lectures given at the Latin American Fisheries Training Center continues. The three volumes of the courses given, already printed, are being distributed among the instructors and students of the Center, as well as the Departments of Fish and Game of the countries of Latin America.

A revision has been made of the working paper on the organization of a network of marine biological laboratories in South America. In the paper, efforts are made to define clearly marine and fisheries biology as well as the exact amount of interest which FAO has in each of these fields of research.

An exhibition of drawings and models based on fish motifs, and made by the students of the elementary schools of Chile, took place at the Ministry of Education in Santiago. The object of the exhibition was to increase the awareness of children and the public of the importance of encouraging fish consumption in Chile. Part of this material was brought to Rome and exhibited during the FAO Conference.

Regional Fisheries Office for Asia and the Far East

During November Dr. C. Miles attended the Executive Committee Meeting of the Indo-Pacific Fisheries Council in Manila, the meeting of consultants to discuss the oceanographic research program for the Indo-Pacific, and the 8th Pacific Science Congress (*see* pp. 25-26). He also visited Hong Kong where he discussed with J. Cater, Director of the Co-operative and Marketing Department, the projected agreement between FAO and the United Kingdom under which a Fish Marketing Training Center would be organized in Hong Kong in 1954. Local arrangements regarding the Center, the curriculum, instructors, etc., were considered.

Dr. Miles is also working on plans for the fifth meeting of the Council, which will take place in Bangkok, Thailand, from 22 January to 5 February 1954.

The Indo-Pacific Fisheries Council has issued the following Occasional Papers:

53/1 U Ba Kyaw "Fishing Industry at Sakanthit, Mergui District, Union of Burma;"

53/2 ————. "A General Pilot Survey of the Fisheries of the Inle Lake, Southern Shan States, Union of Burma;"

53/3 "Summary of Investigations carried out in India on *Chanos Chanos*."

Personnel

Dr. Ernest Hess has succeeded Mr. Mogens Jul as Chief Technologist.

Mrs. Anna Mae Singer Jul, Assistant Editor of the *FAO Fisheries Bulletin* since 1950, resigned effective 30 November 1953, to join her husband in Denmark. Mrs. Jul had been with the Fisheries Division since 1947 when she was appointed as a Research Assistant.

W.H. Schuster, who has been with the FAO Fisheries Division since July 1951 as a fish culturist, has resigned for health reasons, and is now living in the Netherlands.

Sidney J. Holt, (U. K.) has joined the Biology Branch of the Fisheries Division as Fisheries Biologist. Mr. Holt received his Bachelor of Science degree from Reading University, England. From 1946 to 1950 he was on the staff of the Lowestoft Fisheries Laboratory, England, doing biomathematical research work on the dynamics of

marine fish populations, especially in relation to overfishing of demersal species in the North Sea. From 1950 to 1953 he worked with Nature Conservancy (a government agency) in Edinburgh, Scotland, on insect and rodent populations, and from September to October 1953 he lectured at the International Training Center for Fishery Biology in Turkey.

Expanded Technical Assistance Program

Resumé of technical assistance progress in fisheries up to 1 January 1954.

Brazil. The fisheries biologist, technolcgist and master fisherman, who have been invited by the Government of Brazil to assist in its program of marine fisheries development, will be recruited in 1954, the master fisherman for assignment in April and the biologist and technologist in July.

British Guiana. The FAO/ETAP Fellow from the Government Fisheries Department has completed his studies under the FAO/ETAP fish culture expert in Haiti, and after visiting the United Kingdom and Europe, has proceeded to India, Thailand, Malaya, Indonesia and Israel.

Ceylon. The two experts who are conducting the FAO/ETAP fisheries program will continue their program in 1954. Alan Glanville (U. K.) reports further interest among local fishermen for small Diesel and semi-Diesel engines, especially on the north coast. The Australian and Canadian Colombo Plan organizations are considering the inclusion in their programs of a rapid acceleration of small craft mechanization by the provision of suitable engines to fishermen in areas where Mr. Glanville has demonstrated that their installation is profitable, and where a demand exists as a result of his efforts; small Danish-built open motor fishing boats have also proved successful. Mr.Glanville, who has recently paid a short visit to Rome after attending the FAO Fishing Boat Congress in Paris, will continue to advise Colombo Plan officers in this field, and will extend his pioneer work to other parts of the coastline.

Other new fields of activity will include the introduction of powered winches for handling greater quantities of gear on craft already fitted with engines ; and the possible substitution of a light, simple dory-type powered craft to work larger quantities of drift nets in place of the log-raft hand-paddled catamarans, which are slow, clumsy, and only capable of carrying very few nets.

The value of the engine maintenance program being developed by Einar R. Kvaran (Iceland) is becoming increasingly apparent as the small craft mechanization gets under way and as a result of the larger craft activities of the Colombo Plan organization. E. R. Kvaran is conducting a training course for fishing boat engine drivers, and this

may become a permanent feature of the government program ; he is also developing, in conjunction with the Headquarters naval architect, an improved design of motorized padavu, a useful type of local craft.

Chile. Dr. de Buen, (Mexico) has concluded his mission as fisheries biologist, and his final report has been received in Rome. J. Fridthjof (Denmark) has also concluded his assignment in December, when he reported in Rome ; he leaves a continuing program, which has been adopted by the Government for developing consumption of fish (*see* pp. 19-21) ; arising out of his work, a Central Co-ordinating Office has been established within the Ministry of Economy to co-ordinate the efforts of other ministries to raise the level of fish consumption. Fishermen's and consumer co-operatives are also being established.

Nominations have been accepted for two Fellows, one in fisheries economics and one in technology. Both candidates are employed in the re-organized Department of Fisheries, and will commence their studies in Europe early in 1954.

In the 1954 program it is proposed to include a fisheries technologist to advise in the second half of the year on fish catching, handling and distribution, also a gear technologist.

Colombia. On request of the Government, the preliminary survey of fish culture possibilities, proposed for the latter half of 1954, will be held in abeyance.

Costa Rica. FAO has agreed to assign a fisheries biologist for twelve months to Costa Rica and Panama to assist in investigations of the shrimp resources, his time to be divided equally between the two countries.

Dominican Republic. S. Y. Lin (China) now has about 15 ponds at his disposal, including several small breeding ponds and a few larger stock ponds. Some 3,500 live fingerling carp from stock developed by the Haitian Government and the FAO/ETAP program were transported from Haiti to the Republic by lorry ; further shipments of carp and *Tilapia* are planned. It is hoped to take full advantage of the oncoming dry season to push forward with the construction of a considerable number of new ponds which will be stocked with fry developed from fish introduced from Haiti.

Ecuador. The report of Dr. E. Schweigger (Peru) on his work as fisheries biologist is being reviewed at FAO Headquarters and he has returned home. A fellowship in fisheries biology has been awarded to a teacher and research worker at the Department of Zoology of the Polytechnical School, Quito, who was participant at the first Latin American Fisheries Training Center. The Fellow will commence his studies in Europe early in 1954.

Finland. An expert to assist in the development of the fish meal and oil industry will be recruited early in the New Year for a short assignment during the Baltic herring season.

Of the six fisheries fellowships awarded, two have completed their studies ; two are still in the field in Europe and North America, and two have yet to begin their training.

Guatemala. On request of the Government, a preliminary survey of fish culture possibilities, proposed for the latter half of 1954, will be held in abeyance.

Haiti. In response to the Government's request, Shimon Tal (Israel) will continue his assignment as fish culture expert until mid-1954. Further carp and *Tilapia* stock have been bred, both for pond culture work and for rough release. The punten carp, brought from Indonesia, have had a very successful spawning, and there is enough fry to stock all the commercial ponds available. This success is particularly important, since this stock will give higher yields and better quality fish both in Haiti and in the Dominican Republic. Good growth has been maintained by the Israeli strains of carp which arrived in August, but these fish have not yet bred ; this stock should also give rise to supplies of fast-growing material.

The rough release of *Tilapia* and carp has been remarkably successful ; *Tilapia* is now widely available in up-country markets, and this additional supply has been found very acceptable to the local population. Carp from natural waters is also reaching the markets.

Honduras. An expert will visit the country during the latter half of 1954 to survey the possibilities of developing a fish culture program similar to those now under way in the Dominican Republic and Haiti.

Hong Kong. The proposed training center in fish marketing has been included in the FAO/ETAP budget for 1954, and it is hoped to hold this center in July, or soon after.

India. Paul Ziener, Naval Architect from Norway, arrived in New Delhi late in September. He has already taken off the lines of a number of local fishing craft in fishing villages on the coast of Bombay State with a view to developing a design of similar type but with an engine installed. The Bombay Government has already made good progress in small craft motorization, especially north of Bombay City, and Mr. Ziener finds the officials and the fishermen most co-operative and receptive of new ideas, for instance, in improved propeller selection for increasing efficiency. It is hoped to recruit a fisheries engineer early in 1954 to work in Madras State ; a second fisheries engineer will be recruited later in 1954 to work in the State of Saurashtra.

Iran. A fisheries engineer will be appointed by FAO/ETAP during 1954.

Iraq. It is hoped to resume the program on inland fisheries initiated in 1953 by A. van den Eelaart (Netherlands), concentrating on the effects of the great irrigation barrages on the migratory movements of fish and measures to be taken to develop the river fisheries to their utmost productive possibilities.

Israel. A. E. Hofstede (Netherlands) has completed his two assignments and his reports on the Lake Tiberias fishery and on pond culture are under review in Rome (*see* pp. 14-18). Both the Israeli Fellows who have been studying fishing methods in various parts of Europe have now returned home.

Liberia. H. van Pel, Fisheries Engineer, is now in Holland on sick leave; he has, however, prepared a report on his 17 months work in the country. His brother, Jan van Pel, is carrying on his program of exploratory fishing, which is now in full swing again after the repair of the 22-foot fishing boat, and private interests have already started, on a commercial scale, to utilize the methods introduced by the FAO/ETAP experts. This work is continuing in 1954.

Malaya. It is hoped to include a fish meal technologist in the 1954 program to advise the Government on the most efficient utilization of fish waste, which is said to be available in useful quantities.

Mexico. The proposed second Latin American Fisheries Training Center has been included in the Mexican program for 1954, and it is hoped that it will take place during the second half of the year.

Pakistan (West). Curt Ohlsson (Sweden) has now refined his design of a mechanized fishing boat, based on the lines of the local fishing craft, on the results of the tank tests carried out early this year in Sweden. This design will, in its turn, be tank tested and the final design transmitted to the Government of Pakistan for full-scale tests.

Panama. Leslie Scattergood (U.S.A.) has completed his assignment. Since he will not be available to continue this biological study of the shrimp fishery (because he has accepted a research fellowship in Europe), the program will be continued in 1954 by another expert, who will be assigned to both Costa Rica and Panama.

Paraguay. An inland fisheries biologist will be assigned to carry out a general survey of the inland fisheries during the second half of 1954.

Saudi Arabia. The Government is setting up an organization to undertake the commercial development of the country's fisheries, and an FAO/ETAP expert, Dr. M. K. el Saby (Egypt), has now assumed duty in the employment of the Government as Chief Technical Adviser on this development. It is proposed to appoint another fisheries expert early in 1954, under FAO/ETAP, to assist the Government in developing its fisheries program.

Somalia. It has not been found possible to obtain outside financial support for resumption of the exploratory fishing program, carried out during the 1952/53 season. It is reported, however, that the Administration of the Trust Territory of Somalia is undertaking a limited program unaided, with fishing gear furnished by FAO.

Thailand. The program to expand inland fisheries and fish culture being carried out by Dr. S. W. Ling (China) will be extended

into 1954. This many sided program continues to develop, and the Thai Government fish culture extension service has expanded to 50 of the 71 provinces in the kingdom (*see FAO Fisheries Bulletin*, Vol. 6, No. 6, p. 254).

Turkey. Further progress has been made by the FAO/ETAP fisheries team. Fisheries biology has now been adopted as an integral part of the development program of the Meat and Fish Office on the advice of Dr. G. E. Rounsefell (U.S.A.); a long-term program of work in support of the Government's development program is in preparation. Specifications of equipment for a fish meal and oil plant for erection at Trabzon have been prepared by Dr. Thor B. Lexow (Norway). Helgi Bergs (Iceland) has prepared designs of refrigeration equipment layout, also filleting and packing lines; the advantages of flake ice production for the fishing industry have been pointed out. George Napier (U.S.A.) has seen three of the government fishing vessels prepared for sea and equipped for trolling; exploratory fishing operations have started. H. K. Henriksen (Norway) assumed duty in Turkey on 13 October as Fisheries Economist. He will advise generally on improving and strengthening the organization and administration of the fisheries industry; and specifically on the commercial fisheries activities of the Meat and Fish Office, including the Trabzon fish meal plant and other projects. All these activites will be continued in 1954.

An International Training Center in Fisheries Biology was held in Istanbul from 21 September to 27 October (*see* p. 32). There were 19 participants, including two from neighboring countries. The training given will undoubtedly facilitate the prosecution of the program of fisheries biological research referred to above.

Fellowship-holder, Orhan Ciragan (Turkey), reported to Rome for briefing en route to Norway where he is studying the manufacture of meal and oil from fish, including the related economic and chemical aspects of this industry. Two further fellowships are planned for 1954.

Yugoslavia. Dr. W. Wunder (Germany) has completed the present phase of his assignment in which the incidence and control of fish diseases on fish farms were intensively studied. These diseases, especially abdominal dropsy among carp, have occasioned serious losses in the pond culture industry, and Dr. Wunder's considered recommendations are likely to reduce these losses considerably. It is proposed to reassign Dr. Wunder in Yugoslavia in 1954 with broadened terms of reference to include a survey of the fish resources in the interior waters of the country, as a preliminary to their more intensive exploitation, as well as a survey to determine possibilities of stocking impounded waters.

W. MacCallum (Canada) has completed his fish refrigeration assignment, and his report will shortly be transmitted to the Government.

E. Tenberg-Hansen (Denmark) assumed duty in Yugoslavia early in October as a fish curing specialist. Under his direction a smoking

tunnel has been erected and run in a cannery which has made possible the utilization of hitherto neglected sprat resources by means of canning.

It is planned to assign a fisheries economist to the country early in 1954 to assist in developing methods for the more orderly marketing of fisheries products. Later in the year an expert will assist in improving gear used on the marine fisheries.

One Fellow has completed his study of fish canning technology in Scandinavia, Germany and North Africa ; another is about to visit Scandinavian and Mediterranean countries to study fish refrigeration and handling. Two further fisheries fellowships are planned in 1954.

Program 1954. In addition to the 33 posts and two training centers mentioned above, which are all in Category I, 11 fellowships have also been provided. In Category II (posts which have had to be deferred) there are 14 further posts and two fellowships.

It is estimated it will cost U.S. $ 363,000 to carry on the projects in Category I and $88,000 for those in Category II, a total of $451,000. If all the requests from Member Governments for technical assistance in fisheries development in 1954 were implemented, a budget of some $1,500,000 to $1,800,000 would be required. This would provide for about 91 experts, 49 fellowships and three training centers. It can be seen, therefore, that under the existing financial limitations the Technical Assistance program of the Fisheries Division in 1954 makes provision to implement only about one-third of the official requests received from Member Governments.

Notes on Films

IT'S THE MAINE SARDINE. Producer and distributor : U.S. Department of the Interior, Fish and Wildlife Service, in co-operation with the Department of Maine Sea and Shore Fisheries, Augusta, Me., and the Maine Sardine Packers Association. Technical data : 16 mm., color, sound, approx. 18 min. running time. titles and commentary in English.

The film gives a description of the Maine sardine industry. It shows the capture of fish in large weirs and trap nets and the use of purse seines. The fish are transferred by the aid of hydraulic pumps from the nets to carrier boats which bring them to the canning plants. The various parts of the canning process are shown, such as brining and steaming, packing into cans, can closing and wrapping, etc. The film also shows the inspection methods used both for fresh fish and the canned product.

The film was awarded first prize, Public Relations Class, 11th International Cinematographic Exposition, Venice, Italy, 1950.

M. J.

SHIPBUILDERS OF ESSEX. Producer and distributor : U.S. State Department, Washington, D.C.. Technical data : 16 mm., black and white, sound commentary and titles in English.

The film gives a general picture of the small wooden ship building industry in Essex, Mass., U.S.A. One follows the owner from the moment he makes the first decision to have a trawler built, sees the inspection of the model of the boat and the keel laying. Details are shown from the mold loft and various parts of the construction process. The film closes with the launching of the trawler. It is mainly intended to picture the village life around the ship building industry and gives comparatively few technical details.

The film was awarded first prize at the 11th International Exhibition at Venice, 1950, in the technical class (one of several).

M. J.

Current Fisheries Literature

Selected Publications

FWS 9.1 MARINE BIOLOGY UDC 57

Riley, Gordon A. Theory of growth and competition in natural
1953 population. *Journal of the Fisheries Research Board of Canada*, Ottawa, Canada. Vol. 10, No. 5, June 1953. pp. 211-223. In English.

Reviews briefly classical theories of population growth and interspecies relations, and discusses the modifications of basic theory to make it applicable to particular species having regard for various aspects of population behavior. Theoretical aspects of the ecology of natural populations are considered, especially as regards ecological groups, such as the phytoplankton, zooplankton, etc. Methods, aims and results of recent theoretical ecological investigations are reviewed, and the significance of such work with respect to higher members of the food chain is discussed.

FWS 6.3 PLANKTON UDC 593.1

United States Department of the Interior, Fish and Wildlife Service. Zoo-
1953 plankton Volumes off the Pacific Coast, 1952. *Special Scientific Report: Fisheries* No. 100. Washington 25, D.C., U.S.A. 41 pp., tables. In English.

A record, prepared by the staff of the South Pacific Fishery Investigations, of the volumes of zooplankton taken on the survey cruises of the California Co-operative Sardine Research Program during 1952, along with information on the plankton hauls. The plankton samples are used in studying the distribution and abundance of the eggs and larvae of the pilchard or sardine (*Sardinops caerulea*), also in studying the productivity of pilchard spawning areas. The method of collection and treatment of the catches is described.

FWS 6.3 PLANKTON UDC 593.7

Fraser, J.H. The Chaetognatha and Other Zooplankton of the
1952 Scottish Area and their Value as Biological Indicators of Hydrographical Condition. *Marine Research* 1952, No. 2, Scottish Home Department. H.M.S.O., 13a Castle St., Edinburgh 2, Scotland. 52 pp., fig., charts, illus. In English. Price: 7*s.* 6*d.*

The Chaetognatha are a useful group of plankton indicators in the North Atlantic as the various species found there are each associated with a particular type of environment. Methods of identification are given with a double set of photographic illustrations, one giving the general, natural appearance of the species when preserved in formalin and the other a duplicate retouched to emphasize the diagnostic features.

The distribution of the Chaetognatha in the area investigated by Scottish research vessels from 1936-39 and 1946-50 is charted and discussed in relation to the hydrography of the area and the distribution of other planktonic indicator species. As an example of the value of the plankton indicator methods in specific problems, the hydrography of the Fair Isle passage is discussed.

FWS 1.014 FISHES — AEGEAN SEA UDC 597(262.4)

Ananiadès, Const. T. Contribution à la systématique et la biologie de
1951 l'espèce *Dentex macrophthalmus* (Bloch) *forma opsophthalmus* (Anan.) de la mer Egée [Contribution to the Systematics and Biology of the Species *Dentex macrophthalmus* (Bloch) *forma opsophthalmus* (Anan.) of the Aegean Sea]. Hydrobiological Institute, Athens Academy, Athens, Greece. 33 pp., illus., tables, bibl. In French, with Greek summary.

Gives a systematic analysis consisting chiefly of relative body proportions together with some account of the reproduction and feeding habits.

FWS 1.014 FISHES — ÆGEAN SEA UDC 597(262.4)

Ananiadis, Const. T. Investigations on the Biology of the Red
1951 Mullet (Surmulet) in the Ægean Sea. Hydrobiological Institute, Athens Academy, Athens, Greece. 23 pp., illus., tables, bibl. In Greek, with English summary.

A report on the examination of 98 samples from different areas including 684 individual specimens. Gives the vertebral count, and body measurements which show heterauxexis. Data of population measurements from the Aegean Sea, the western Mediterranean and the Atlantic coasts are compared and the results summarized in tables. The biology and the fishing methods and conditions are described.

FWS 1.0149 FISHES — ITALY UDC 597(45)

Palombi, Arturo, and Santarelli, Mario. Gli Animali Commestibili dei Mari
1953 d'Italia [Edible Sea Animals of Italy]. Ulrico Hoepli, Milan, Italy. 349 pp., illus., index. In Italian. Price : Lire 3,800.

Gives photographs and illustrations of tunicates, echinoderms, mollusks and crustaceans of economic importance found in Italian seas, and indicates their economic value in qualitative terms. Gives brief notes on the habitat and the fishery, as well as extensive lists of Italian dialectic names and of common names in other European and Scandinavian countries. Simple keys are provided.

FWS 1.011 LAMPREYS, ETC. — U.S.A. UDC 597.2(73)

Loeb, Howard A. Sea Lamprey Spawning : Wisconsin and Minnesota
1953 Streams of Lake Superior. *Special Scientific Report : Fisheries* No. 97. United States Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. 36 pp., fig., tables, bibl. In English.

Account of an extended survey of streams in the Lake Superior basin, which are producing, or may produce, sea lamprey in the future. Twenty-two streams are listed in which control structures should be erected, since it is suspected that they can support spawning runs of considerable size. The survey is part of a general program for control of sea lamprey.

FWS 1.2 HERRINGS, ETC. — GREECE UDC 597.5(495)

Ananiadès, Const. T. Quelques considérations biométriques sur l'allache
1952 (*Sardinella aurita* C. et V.) des eaux grecques [Some Biometric Considerations on the Sardine (*Sardinella aurita* C. and V.) of Greek Waters]. Hydrographical Institute, Athens Academy, Athens, Greece. 45 pp., illus., tables, bibl. In French, with Greek summary.

Gives body proportions, weight and length, reproduction, feeding, and some statistics of the fishery for this species.

FWS 1.95 WHALES, DOLPHINS AND PORPOISES UDC 599.51

Sakiura, H., Ozaki, K., and Fujino, K. Biological Investigation of
1953 the Northern Pacific Baleen Whales Caught by the Japanese Whaling Fleet in 1952. Fisheries Agency, Tokyo, Japan. 64 pp., fig., tables, bibl. In English.

Reports the examination of 319 whales of blue, fin, humpback and sei species. Examination was made in accordance with the methods adopted by the Discovery Investigation. Reports composition of the catch and presents data on gonad and body length, seasonal growth of foetus, thickness of blubber, external parasites, stomach contents and other features. The biological characteristics of the catch are summarized.

FWS 1.95 WHALES, DOLPHINS AND PORPOISES UDC 599.53

Japan, Fisheries Agency. Report on Whale Marking in Japan. No. IV.
1953 Bonin Islands, Sanriku-Hokkaido and South Kurile Islands Areas, 1952. Tokyo, Japan. 20 pp., tables and 11 figures. In English.

Reports results of operations in whale marking and the oceanographic conditions under which they were discovered. Observations are made on the direction of swimming in relation to recorded conditions. Discoveries of marks are reported.

FWS 1.95 WHALES, DOLPHINS AND PORPOISES UDC 599.53

Sakiura, H., Nozawa, Y., and Ozaki, K. Study on Maturity and Blub-
1953 ber Thickness of the Whales Caught in the Adjacent Waters of Japan. Fisheries Agency, Tokyo, Japan. 25 pp., fig., tables., bibl. In English.

Presents an analysis of data, obtained during 1950, 1951 and 1952, relating to sei, fin, sperm and blue whales, consisting of records on weight of ovary, frequencies of number of *Corpora lutea*, weight of testis and average body length at which sexual maturity is attained, which are then related to data on thickness of blubber and its monthly variation.

FWS 9.14 FISHES — STOMACH CONTENT UDC 637.56

McIntyre, A.D. The Food of Halibut from North Atlantic Fishing
1953 Grounds. *Marine Research* 1952, No. 3, Scottish Home Department. H.M.S.O., 13a Castle St., Edinburgh 2, Scotland. 20 pp., fig., tables., bibl. In English. Price : 4s.

Reports the results of examination of 1,225 halibut stomachs from Iceland, Faroe, west of Scotland, the North Sea and Newfoundland. Describes the composition of the food and its variation by area and by season, and discusses feeding variations with age. It is shown that halibut feed mainly on fish, decapod crustacea, and cephalopoda ; that a change in feeding occurs with age ; that feeding tends to be greater in summer than in spring and that the halibut population is supported by a small number of species.

FWS 1.0146 FISHERIES RESEARCH — NORTH SEA UDC 639.2(42)

Parrish, B.B., and Jones, R. The State of the Haddock Stocks in the
1953 North Sea 1946-50 and at Faroe 1914-50. *Marine Research* 1952, No. 4 : *Haddock Bionomics* 1. Scottish Home Department. H.M.S.O., 13a Castle St-, Edinburgh 2, Scotland. 27 pp., fig., tables, bibl. In English. Price : 5s.

This paper is in two parts, the first of which discusses the Faroe stocks from 1914-50, and the second discusses the North Sea stocks from 1946-50. Statistics of landings and of fishing effort are reviewed and the catch per

unit effort is analyzed in accordance with modern statistical methods describing the relations of fishing effort with the catch and its composition. Conclusions are adduced as to mortality rate and it is suggested that the yield from the Faroe banks must be expected to be appreciably less than the theoretical maximum and that the postwar stocks in the North Sea are overfished.

FWS 1 FISHERIES — GREECE UDC 639.2(495)

Ananiadis, Const. I. A Preliminary Survey of the Haghios Vassilios
1953 Lake. Hydrobiological Institute, Athens Academy, Athens, Greece. 47 pp., illus., tables, bibl. In English, with Greek summary.

Gives a description of the lake, including physiographic data, hydrology, geological origin, and some physics and chemistry of the water. Gives some account of the biota, the feeding habits of certain of the fish studied, and the fishing exploitation including methods, seasons, production, and suggestions for the regulation and improvement of the lake.

FWS 9.12 FISHERIES RESEARCH, BIOLOGICAL UDC 639.2.001.5

Cleve, Richard van, and Seymour, Allyn H. The Production of Hali-
1953 but Eggs on the Cape St. James Spawning Bank off the Coast of British Columbia 1935-1946. *Report of the International Fisheries Commission* No. 19. Seattle, Wash., U.S.A. 44 pp., fig., tables., bibl. In English.

Reports the result of sampling the Cape St. James spawning grounds with one-meter Michael Sars plankton nets each winter from 1935 to 1946, excepting 1944. Evidence from tagging of mature fish indicates that the spawning stock at Cape St. James is drawn primarily from the fishing grounds within a radius of about 150 miles from the place of tag. Eggs were usually found 75 to 400 meters below the surface in water specific gravity from 1.02540 to 1.02660. No major drift of the eggs into or out of the area was noted. Reports variations in egg abundance 1937 being the year of greatest abundance. Correlation of egg abundance with recruits, spawning stock and water temperature was measured and only that with water temperature was found significant.

An appendix is given on statistical methods.

FWS 9.12 FISHERIES RESEARCH, BIOLOGICAL UDC 639.2.001.5

Dannevig, Gunnar. Beskatningen av skreibestanden hva Merkeforsok i
1953 Lofoten Viser [Exploitation of the Codfish Stock. Tagging experiments with Lofoten Fish]. *Fiskeridirektoratets Skrifter, Serie Havundersøkelser* (Report on Norwegian Fishery and Marine Investigations). Director of Fisheries, Bergen, Norway. I, Vol. 10, No. 8, pp. 1-37., fig., tables, bibl. In Norwegian, with English summary.

Reports the results of annual tagging experiments carried out since 1947 on cod of the Lofoten Banks during the spawning season. Results indicate that after spawning the cod migrate northwards along the Norwegian coast to the feeding grounds in the Barents Sea. In November, December, they again approach the Norwegian coast. Results of experiments on tag types show that hydrostatic tags are more frequently reported in the long run than several other types. Recovery rates are entered, varying between 13 and 40 percent and are taken to indicate considerable intensity of fishing.

FWS 9.12 FISHERIES RESEARCH, BIOLOGICAL UDC 639.2.001.5

Rae, B.B. The occurrence of Lemon Sole Larvae in the Scottish
1953 Plankton Collections of 1929, 1930 and 1931. *Marine Research* 1953, No. 1. Scottish Home Department. H.M.S.O., 13a Castle St., Edinburgh 2, Scotland. 36 pp., fig., tables, bibl. In English. Price : 7s.

Records of lemon sole larvae in plankton catches from the North Sea and west of Scotland grounds during the years 1929 to 1931 have been analyzed. The larvae were measured and classified according to their stage of development and their occurrence in time and place is discussed. The spawning period adduced from these results is compared with evidence from several sources, and the extent of the spawning area in these waters is indicated. The dispersal of the eggs and larvae by the prevailing currents is discussed and the importance of the effect of the various eddies is emphasized. Vertical distribution of the larvae is discussed, the larvae lying chiefly at a depth of 51 to 100 meters, but showing also negative heliotropic vertical movements.

Correlation of larvae numbers with adult fish in later years was attempted and proved inconclusive. Metamorphosis and changes in distribution and way of life are described.

FWS 9.12 FISHERIES RESEARCH, BIOLOGICAL UDC 639.2.001.5

Saetersdal, Gunnar S. The Haddock in Norwegian Waters. I. Ver-
1952, tebrae Counts and Brood Strength Variations of Young
1953 Fish. II. Methods in Age and Growth Investigations. *Fiskeridirektoratets Skrifter, Serie Havundersøkelser* (Report on Norwegian Fishery and Marine Investigations). Director of Fisheries, Bergen, Norway. I, Vol. 10, No. 4, 14 pp., fig., tables, bibl. In English. II, Vol. 10, No 9, 46 pp., fig., tables, bibl. In English.

I. Deals with the results of research on young haddock from northern Norway and the Barents Sea. The investigation covered the period September 1948 to August 1951. Vertebrae counts were made, brood strength and growth measured, and it is shown from the uniformity of these results that the areas investigated are inhabited by one main population. Eggs and larvae were collected and it is shown that the main spawning ground of the population is probably located south of Lofoten.

II. Reports the results of an investigation of methods used in determination of age and growth of haddock. The material consisted of 29 samples of young fish taken during three years from prawn trawl catches in Brandsfjord in Trøndelag. It is shown that great variations may occur with the seasons of zone formation and that there is a close connection between seasons of zone formation and annual rhythym of growth. The author's own procedure in scale reading and calculations is reported.

FWS 1.0146 FISHERIES RESEARCH, BIO- UDC 639.2.001.5(42)
LOGICAL — GREAT BRITAIN

Scottish Home Department. Fourth Annual Report of the Super-
1953 visory Committee for Brown Trout Research 1951-1952. *Freshwater and Salmon Fisheries Research* 4. H.M.S.O., 13a Castle St., Edinburgh 2, Scotland. 12 pp. In English. Price : 2s.

Contains the report of the officer in charge of the Brown Trout Laboratory at Pitlochry, 1951-1952. Gives information on progress made in the investigations on the biology of trout, on studies of the bottom fauna in various lochs and on field fertilization experiments conducted in four lochs in the Tummel-Garry catchment area.

FWS 9.1 FISHERIES RESEARCH, BIOLOGICAL — U.S.A. UDC 639.2.001.5(73)

Cope, Oliver B. Length Measurements of Lake Yellowstone Trout. 1953 *Special Scientific Report: Fisheries* No. 103. United States Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. 17 pp., fig., tables, bibl. In English.

Assembles information on biometric studies on *Salmo clarki lewisi*. Comparisons are made between differences in mean total length from year to year to serve as a basis for recognition of critical alterations in the composition of stocks. The study is part of a program for regulation of the Lake Yellowstone fisheries.

FWS 9.17 FISHERIES MANAGEMENT, CONSERVATION UDC 639.2.04

Kerr, James E. Studies on Fish Preservation at the Contra Costa 1953 Steam Plant of the Pacific Gas and Electric Company. *Fish Bulletin* No. 92, California Department of Fish and Game. California State Fisheries Laboratory, Terminal Island Station, San Pedro, Cal., U.S.A. 66 pp., tables, fig. In English.

Describes the historical background to the problem of protection of fish at the Contra Costa Steam Plant and the steps taken to effect urgent rescue measures, and gives a detailed account of the research program to determine the magnitude and character of the problem and to evolve new apparatus to protect the fish. Investigations included a study of fish behavior in relation to water velocity and temperature and experimental work on different types of apparatus and their operational program. The development of a special fish collector is described and illustrated.

FWS 2.1124 FISHING METHODS AND GEAR — TRAPS — POUND NETS UDC 639.2.081.111

Kelley, D.W. Fluctuation in Trap-Net Catches in the Upper Mis- 1953 sissippi River. *Special Scientific Report: Fisheries* No. 101. United States Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. 38 pp., fig., tables. In English.

Under guidance of the Upper Mississippi River Conservation Committee, a project was set up for gathering information on the fish populations by a series of test-netting surveys. The paper deals with the fluctuations of trap-net catches at permanent netting stations near La Crosse, Wisconsin, and an attempt is made to evaluate some of the factors found to influence the catch of trap nets.

FWS 1.011 FISHERIES INDUSTRIES — TUNAS, MACKERELS, ETC. — U.S.A. UDC 639.227(73

Anderson, A.W., Stolting, W.H., and Associates. Survey of the Do- 1953 mestic Tuna Industry. *Special Scientific Report: Fisheries* No. 104. United States Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. 436 pp., fig., tables. In English.

Describes the species of tuna and tuna-like fishes and the history of the U.S. tuna industry in the Pacific, as well as historic developments in the import trade, fish craft and gear, canning processes and by-products. Consumption trends and patterns in the U. S. A., and world production of tuna in the various parts of the world, are discussed. Domestic production and processing are reviewed in detail, and description given of the marketing of tuna products and of governmental assistance in the tuna industry in the U. S. A., and other countries.

FWS 9.17 FISHERIES MANAGEMENT—FISHWAYS, UDC 639.313
FISH LADDERS

Talbot, G.B. Passage of Shad at the Bonneville Fishways. *Special Scientific Report: Fisheries* No. 94. United States Department of the Interior, Fish and Wildlife Service, Washington D.C., U.S.A. 30 pp., tables, fig., bibl. In English.
1953

Reports observations on the passage of shad (*Alosa sapidissima*) through fishways in the Columbia River. Catches of shad on the Atlantic coast of the U.S.A. dropped to less than one-fifth of their former size after dams had been constructed which prevented the fish from reaching their natural spawning grounds. Many of the dams have fishways but generally shad do not use them, owing to inaccessibility of entrance and lack of attractive currents. Bonneville fishways have been successfully passed by large numbers of shad. Fish locks appear to be as effective as ladders. Success at Bonneville demonstrates that shad can be induced to use fishways as readily as salmon.

Journals and Periodicals

Annales biologiques (Conseil permanent international pour l'exploration de la mer, Charlottenlund Slot, Copenhagen Denmark), Vol. 8, 1951.
1952

Bulletin français de pisciculture (14, av. de Saint-Mandé, Paris, 12), No. 170, July-September 1953.
1953

Vibert R. "Voyages maritimes des saumons et retour à la rivière natale."

Bulletin of the Bombay Acquarium Society (Taraporevala Acquarium, Bombay 2, India), Vol. 1, No. 1, September-October 1953.
1953

International Fish Journal (Urtehaven 6A, Copenhagen-Valby, Denmark). No. 1, September 1953. (In English and Spanish).
1953

Journal of the Fisheries Research Board of Canada (Ottawa, Canada), Vol. 10, No. 6, July 1953.
1953

Foerster R. E. and Ricker W.E. "The Coho Salmon of Cultus Lake and Sweltzer Creek," pp. 293-319.

Pike, Gordon C. "Colour Pattern of Humpback Whales from the Coast of British Columbia." pp. 320-25.

Grainger, E. H. "On the Age, Growth, Migration, Reproductive Potential and Feeding Habits of the Arctic Char (*Salvelinus alpinus*) of Frobisher Bay, Baffin Island." pp. 326-69.

Journal of the Marine Biological Association of the United Kingdom (Cambridge University Press, Bentley House, 200 Euston Road, London, N.W.1), Vol. 32, No. 2.
1953

Bainbridge, Richard. "Studies on the Inter-relationships of Zooplankton and Phytoplankton." pp. 385-447.

Chipperfield, P.N. J. "Observations on the Breeding and Settlement of *Mytilus edulis* (L.) in British Waters." pp. 449-76.

Journal of Wildlife Management, The (Cayuga Press Inc., 113 East Green Street, Ithaca, N.Y., U.S.A.), Vol. 17, No. 4, October 1953.
1953

Krumholz, Louis A. and Emmons, A. H. "Preparation of Fish Tissues for Gross Beta Radioassay." pp. 456-60.

Raney, Edward C. and de Sylva, Donald P. "Racial Investigations of the Striped Bass, *Roccus saxatilis* (Walbaum)." pp. 495-509.

Publications of the Hydrobiological Research Institute (Faculty of Science,
1953 University of Istanbul, Istanbul, Turkey, Series B, Vol. 1, No. 3, July 1953.

LINDBERG, K. "Cyclopides (Crustacés copépodes) de la Turquie en particulier comme habitants de grottes." pp. 149-85.

KOSSWIG, CURT. "Über die Verwandtschaftsbeziehungen anatolischer Zahnkarpfen." pp. 186-98.

ULLYOTT, PHILIP. "Conditions of Flow in the Bosphorus." pp. 199-214.

KOSSWIG, CURT. "Some biological aspects of fishery work in Turkey." pp. 215-23.

Report of the International Fisheries Commission No. 20. Regulation and
1953 Investigation of the Pacific Fishery in 1952, by Edward W. Allen *et al.* (Seattle, Washington, U.S.A.).

Review of Salted Fish Production and the European Markets 1952-53 *Sea-*
1953 *son.* (Hawes and Company, Imperial House, London E.C.2.).

Veröffentlichungen des Instituts für Meeresforschung in Bremerhaven (Kom-
1953 missionsverlag Franz Leuwer, Bremen), Vol. 2, No. 2.

KÜHL, VON H. and MANN, H. "Beiträge zur Hydrochemie der Unterelbe." 1953. pp. 236-69.

WYRTKI, VON K. "Ergebnisse über die Verteilung der Trübung in Küstennähe." pp. 269-78.

KLEMENT, VON O. "Die Vegetation der Nordseeinsel Wangeroge." pp. 279-379.

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———. and ST. VALLIN. "Epidemisches Absterben von *Eurytemora* im Bottnischen Meerbusen, verursacht durch Leptolegnia baltica nov. spec." pp. 215-23.

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Gold Coast. REPORT ON THE FISHERIES DEPARTMENT FOR THE YEAR 1951-
1953 52 (Government Printing Department (Publications Branch) Accra, Gold Coast; Crown Agents for the Colonies, 4 Millbank, London, S.W.1.). Price: 2s.

Kenya, REVIEW OF KENYA FISHERIES 1951 (Government Printer, Nairobi,
1952 Kenya). Price: 3s. 6d.

Scotland, Freshwater Biological Association. TWENTY-FIRST ANNUAL
1953 REPORT FOR THE YEAR ENDING 31ST MARCH 1953 (The Ferry House, Far Sawrey, Ambleside, Westmorland). Price: 3s.

Scotland, Scottish Marine Biological Association, ANNUAL REPORT 1952-
1953 53 (Marine Station, Millport, Isle of Cumbrae, Scotland).

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1952 ANNUAL REPORT FOR THE FISCAL YEAR 1952 (Washington 25, D.C., U.S.A.).

STABILIMENTO TIPOGRAFICO FAUSTO FAILLI - ROMA